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Master Subway Problem —Real Estate News—Schools—Gardens —Poultry—Financial—Games—Problems

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SUBWAY BUILDERS' MASTER TASK IN THE WILLIAM STREET MARSH

Delicate Work of Guarding $40,000,000 in Property From Quicksand Is Engineers' Problem

System of bracing to hold up the sidewalks and roadway while tunnel is being built.

A view of narrow William street, through which the much discussed section of the subway is to run.

AN eminent engineer suggested a novel scheme for the destruction of Boston a few years ago. His intention was to illustrate a theory rather than to advance a practical proposition. As he put it:

"An enemy need not bother mustering battleships or waste his time bombarding from afar the intellectual Hub of this land of ours. In time of peace let him have his spies build a big pumping station right in the middle of that city and at the proper time start drawing indiscriminately from the ground below the water saturating the subsoil. You know a very large part of Boston's big buildings rests upon floating foundations. Pump out the water in the supporting quicksand, and down those structures would tumble into the yawning cavities so created. It would be far more effective in its demolition than the projectiles of a hostile fleet!"

A somewhat similar idea occurred to a good many of the property owners along William street when the plans for the new subway were under discussion. Their holdings have an assessed value of $40,000,000, and it was not pleasant to think of what might happen when the contractors reached the stratum of quicksand.

Their anxiety provoked all sorts of arguments against running the subway through that narrow street. In the end the Public Service Commission was so well convinced that the work could be done without needless hazard that it assumed responsibility for any resulting property damages. To-day quite twenty-three per cent. of the excavating is an accomplished fact; the public scarcely realize what is taking place beneath their feet, and none of the adjacent skyscrapers has sagged a hair's breadth.

The municipal engineers have learned much during the years that have intervened since the first subway was built, and much other information has come to them in connection with the construction of Manhattan's towering office buildings. It was this accumulation of knowledge that gave the experts courage to tackle the exceptional task which the William street subway represents.

The street is very narrow, the foundations for the flanking structures are shallow and the loads upon these foundations are enormous. As a matter of fact some of these buildings lay a burden of from thirty to forty tons upon every linear foot of their substructure, and in some cases where the load is distributed upon piers as much as from 500 or 600 tons is concentrated upon single columns. It is evident that under the best of conditions it would be a perilous matter to burrow indiscriminately below these supports, and yet that is exactly what the contractors are doing to-day in the prosecution of their work. As one engineer expressed it, "We shall be upon the firing line when we get down to the foundation limits of these buildings, and just as nature may change in her mood or state there so must we muster our forces and alter our attack and defence. We must carry on our backs, as it were, the burden of the flanking buildings while we form the walls of the subway which, when done, will be rigid enough to hold in place the supporting groundwork of the skyscrapers."

In order that the layman may understand the peculiar conditions that have to be met in digging the William street subway it is needful to give some idea of the physical conditions of the ground below the street level. The tunnel has to make its way through sand and gravel and quicksand and at no point will solid rock offer a resting place. The excavators are working in the midst of the primordial, and each foot of advance confirms the findings of the preliminary explorations. According to John H. Madden, the assistant division engineer, conditions are those demanding the nicest sort of engineering skill.

From the borings made rock was shown as lying from forty-six feet to over one hundred feet below the surface, and it is explained that the retreat of the glacier which once covered this territory and terminated in the vicinity of New York had been followed by the formation over the rock outcrop of a layer of hardpan, consisting of broken rock and detritus cemented with clay.

The water from the ocean had advanced, covering the lower section of Manhattan Island, and the fine sand carried by this ocean water had settled until the thickness of the bed reached the then water level. The overlying, coarser layers were subsequently formed from inland sources. The first deposit of sand was water worn and saturated, having very fine grains from one-hundredth to one-thousandth of an inch in diameter, resembling, when flowing, a heavy dense liquid.

A part of the William street subway must traverse a section of the city known to civil engineers as "the marsh," and semi-liquid sand abounds there in pockets. So long as the stuff is confined it is not a menace to superposed structures and, in fact, it has a notable supporting capacity, but the peril lies in tapping these pockets and letting the stuff run away. Technically this is the material commonly called quicksand. Mr. Madden says:

"This is the blanket of quicksand encountered below water level in the lower sections of the city. Its name comes from a German phrase which, translated, means 'swimming sand.' While this sand would settle in the water if the latter were absolutely still, the slightest agitation would cause it to resume its original condition of 'swimming' in the water from which it had been deposited. While quiescent and confined such sand is practically incompressible and, therefore, possesses a high bearing value; but when released it becomes quicksand of acknowledged treacherous and unstable properties.

"Before the plans for the subway were completed there was an exhaustive discussion as to the methods for excluding material of this nature from excavations extending below water level. Evidence was submitted to show that fluctuations of the ground water could be traced to the rise and fall of the tide, and that, in the case of a twenty story building, the foundations had purposely been set one inch above the desired elevation so as to provide for the settlement anticipated when the full building load was applied. It was said that a settlement of that amount subsequently developed."

In other words, this meant that the structure in question was, in effect, a floating one resting upon confined quicksand. Therefore, a further and more serious subsidence might take place if this semi-fluid support were drained away. How, then, have the engineers successfully met the novel and trying circumstances imposed by this route? Mr. Madden explains the method thus:

"A top heading was first excavated below the street surface between the outer walls of the building vaults, which, in general, occupy the full width of the sidewalk to the curb line. This excavation is confined to the minimum depth, which will provide clearance for small muck cars below existing sub-surface pipes and conduits, but is kept above the bottom of the building foundations. When the level of the latter is approached, longitudinal timber bulkheads are provided along the heading to retain a sufficient weight of material above the underlying soil so as to prevent displacement of ground under the foundations.

"In this way, the foundation may be exposed from the street side and, for that reason, we do not have to enter the building for underpinning purposes. It also affords means for the removal of the excavated soil through shafts located for the main excavation. In addition, by a system of drainage ditches and sumps, the ground water is drawn off by a slow filtering through the soil as the heading advances."

It is this slow filtering which prevents any wholesale displacement of quicksand and the like. These trenches or drains are the engineers' field works in his battle with unstable soils, and by sapping them gradually of their dangerous constituent, water, the materials acquire stability.

In this way, the workers have already lowered the level of the ground water a matter of seventeen feet. But it does not suffice merely to draw off this troublesome water; it is equally necessary to prop up the exposed foundations when the bottoms of these are reached.

The contractors for this section of the subway, Smith, Hauser & MacIsaac, figure upon spending pretty nearly as much for the underpinning of the adjacent buildings as it will cost to do the digging. In other words, to support the $40,000,000 worth of abutting structures, they will have to spend quite $604,500, while the subway excavation itself will cost a little more than $700,000.

"It will be readily appreciated that the underpinning of buildings along the route is a very prominent factor in the work," says Mr. Madden. "The conditions encountered are unique in the number of large and heavy buildings, few of which have foundations to rock or hardpan, and with these exceptions all other foundations are above the subway subgrade and uniformly above water level as well.

"There are forty-five buildings of less than seven stories (assessed valuation $7,000,000), twenty buildings of from seven to twelve stories in height (assessed valuation $18,000,000), and ten buildings of from thirteen to twenty stories in height (assessed valuation $15,000,000). Aside from three of the caisson type the foundations include wooden piles supporting concrete footings, steel and concrete grillages and continuous concrete base walls.

"Irrespective of the present construction the work in connection with the subway must be conducted with the view of not only permanently transferring the building loads to an adequate bearing outside of the influence of the contemplated excavation, but, in addition, of securing all underlying ground from any displacement which might affect the integrity of any portion of the abutting of adjacent buildings."

How have the engineers proceeded so far? Mr. Madden says:

"The method of underpinning contemplates the least possible disturbance of existing foundation piers or footings and is accomplished by introducing longitudinal steel beams or girders judiciously close to the bottom of the foundation, between which cross beams are placed on each side at each pier, and this steel grillage is then pinned into the footings and concreted solid, producing, in effect, a supplementary spread foundation.

"Excavation is then started between each set of piers for an underpinning pit below the grillage and the sides of the pit are protected with carefully placed horizontal sheeting boards as it increases in depth. This continues until ground level is attained, below which steel casings fourteen inches in diameter are sunk in two foot lengths with hydraulic jacks until they extend a proper distance below the bottom of the proposed subway excavation.

"When the required depth has been reached the casing is filled with concrete, and when the full number of piles are in place the pit is concreted to within about two feet of the concreted grillage and, with vertical street struts, a direct transfer of the load is effected by use of steel wedges and steel bearing plates, and this remaining space is then concreted and grouted solid with a rich cement grout. Grout is very fluid cement which permeates and fills up all interstices.

"On the completion of the pit the foregoing operations are repeated until the requisite number for adequately supporting the building loads have been provided. In most instances these pits are made continuous by successive operations so as to form a cut off wall for the entire length of the building, thus preventing any displacement of soil under the interior floors or footings lying behind

"In cases, however, where the material encountered will permit the pits are connected with close sheeting; that is, tongued and grooved planks, to attain that purpose. These cut off walls are extended across each intersecting street. Up to date the results have met every expectation and the progress has exceeded the original estimate. In fact we have in this way underpinned all of the buildings contiguous to Hanover Square."

Perhaps some readers may not be able to understand perfectly the terms Mr. Madden has used. By "heading" he means the excavating done immediately under the two layers of heavy planking which take the place of the asphalt paving of the street. "Grillage" is that building up of timbers placed crosswise which answers for the time being as a support, and this arrangement of grillage is one of the restless processes of the work. In some cases great wooden girders a full foot square in cross section and many feet long, rather inappropriately called "needle beams," are laid beneath the street crosswise, and then, as the dirt is dug away under them, supporting posts, equally sturdy but not more than six feet long, are placed upright to hold the needle beams aloft. It is in this fashion that the excavators get deeper down stage by stage.

The cutting from time to time has uncovered gas pipes, water mains, drains and sewers. These the subway builders disturb as little as possible. When finished the William street subway will have a total length of 2,643 feet. The structure will be of standard two track type, requiring an excavation about 29 feet in width, which at stations will be increased to the full width of 40 feet between the building lines to provide for island platforms, from which stairways will extend to a mezzanine passageway connecting with the entrance stairs to the surface.

The depth to subgrade will vary from 25 to 31 feet below the surface, and in general the excavation will extend from 3 to 5 feet below mean high water, with a maximum of 14 feet at Maiden lane and 20 feet at Pearl street below that datum.

FATHER CURRY AND THE CONVICT

BECAUSE of his religious work among the prisoners in the Tombs and Sing Sing for many years the Rev. James B. Curry, pastor of St. James's Roman Catholic Church in James street, is one of the best informed men in the city regarding the good and the evil qualities to be found in criminals.

For this reason Father Curry's opinions on the possibility of true reformation on the part of the criminal are of especial interest.

"There is no doubt that some of them do make good if the world gives them the chance," said Father Curry. "But the chief difficulty lies in the attitude of the world toward the man who has been in prison."

"Speaking of Warden Osborne's theories I think he has the right idea. There is no doubt that there is room for great improvement in the conditions that exist in Sing Sing. There should be no such things as dark cells or anything like that, for it is easy enough to govern the men, provided you understand them and treat them like human beings instead of beasts. Warden Osborne has had sufficient experience and has amply studied the question to understand the best methods for improving the prison.

"Here is a little incident which convinced me that some of Thomas Mott Osborne's ideas which were installed at Auburn prison at his suggestion after he had served a week's sentence there produce some good.

"A young man whom I was interested in had been arrested for an offence and I used some influence to have the man released, believing that he was a good man at heart and had committed the offence on an impulse. He wished to get married and I loaned him money, I think about $19, to help pay for furnishings for his home.

"Just when I thought I had this young man on the right path, greatly to my surprise he was again arrested, and it being the second offence, he was sentenced to Sing Sing. I'll admit that I was so disappointed and surprised that I lost interest in his case and decided to wipe my hands of the affair. Appeals were made to me to help him again, but I turned a deaf ear to all of them.

"Not long after I had occasion to visit Sing Sing, and while there I was informed that this man, whom we will call James, had committed an assault on another prisoner with an iron bar and for the assault he had been transferred to Auburn prison, where some of Mr. Osborne's suggestions had been put in practical use. Incidentally I wish to tell you that James was good at heart but had a violent temper, which was the cause of the assault on his fellow prisoner.

"Well, I had forgotten all about James when I received a letter one day in which was enclosed the equivalent of the money I had loaned him some months previous. In his letter James stated that he had never intended to cheat me out of the money, but he did not have the opportunity of getting together the sum of $19 until he reached Auburn. By dint of hard work and economizing on extras, such as tobacco, he had been able to save the amount. Of course this sacrifice on James's part so impressed me that I renewed my interest in him. But I could not see my way clear to accept the money earned under such conditions. I sent the money to Father Cashin, chaplain of Sing Sing, who the request that he distribute it among the prisoners in the death cells.

"On my next visit to Sing Sing Father Cashin met me and told me that James was there, not as a prisoner, but as a delegate at large from Auburn, where they had some sort of organization such as the Golden Rule Brotherhood which has been formed at Sing Sing. When I met James I never saw such a changed man in all my life. All the criminal features in his face had been eradicated. Why, the expression in his face was almost angelic.

"James informed me that the conditions in Auburn were such that they had changed him completely. Since his incarceration there his character had undergone a complete transformation. While in Sing Sing he was morose, vindictive and selfish, but on being transferred to Auburn, under the changed conditions for the better, he became joyful, optimistic and devoted much of his time to doing good work among the prisoners and charitable deeds.

"In fact, I was so impressed with the complete transformation that I said to him, 'James, you look so good now that you could wear one of these collars and be one of us,'" and Father Curry put his finger on his clerical collar to emphasize his words.

"Apropos of capital punishment," Father Curry went on, "I do not believe in capital punishment personally, but I admit the State has the supreme right to take a life for a life. The Roman Catholic Church admits this right. Warden Osborne has expressed my sentiments when he declared that while he is against capital punishment he will execute prisoners and do the work thoroughly according to law as long as the law compels him to. Therefore, before any of our suggestions can be put into practice the law must be changed. If you could visit the death house and see the condemned prisoners in their cells you would not hesitate to raise your voice in favor of abolishing capital punishment. The prisoners in the death cells are under a terrible strain which is really inhuman.

"My suggestion is that capital punishment be abolished and life imprisonment be substituted, with the power of commutation removed from the Governor. However, such prisoners should be granted the privilege of a new trial on the presentation of new evidence, &c. I think life imprisonment would be just as effective in preventing crime as capital punishment."